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ABSTRACT

The study investigated the effects of reading level and stimulus presentation mode on the associative clustering and recall performance of mentally retarded adolescents. The subjects were administered a randomized list of twenty words from four conceptual categories. For each of four trials, these words were presented via the auditory, visual or combined auditory-visual modes. The subjects in each condition were divided at the median on the basis of reading grade levels. The major findings of the study were that bimodal presentation had a significant facilitating effect on recall but not on clustering. Reading level was not significantly related to either recall or clustering. (Author)

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Abstract

This study investigated the effects of reading level and stimulus presentation mode on the associative clustering and recall performance of mentally retarded adolescents. The Ss were administered a randomized list of twenty words from four conceptual categories. For each of four trials, these words were presented via the auditory, visual or combined auditory-visual modes. The Ss in each condition were divided at the median on the basis of reading grade levels. The major findings of the study were that bimodal presentation had a significant facilitating effect on recall but not on clustering. Reading level was not significantly related to either recall or clustering.

THE USE OF THE ASSOCIATIVE CLUSTERING TECHNIQUE IN THE STUDY OF READING DISABILITY: EFFECTS OF PRESENTATION MODE[1]

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For slightly more than a decade, various investigators have used Bousfield's (1953) associative clustering technique to explore possible areas of cognitive deficiencies in mentally retarded individuals. Briefly, the associative clustering technique is a method of assessing the spontaneous organizational tendencies observed in the free recall of verbal material by a variety of Ss. One theoretical interpretation of the clustering phenomenon has been offered by Wallace & Underwood (1964), who suggest that this tendency may reflect the utilization of certain verbal mediators, which those authors label "implicit associative responses." Thus, a category name (or superordinate) may have acquired strong associations with a number of words subsumed under the category. The result is that when a particular word is recalled, the superordinate tends to be elicited which, in turn, increases the probability that other words from the same category will be evoked. Individuals who perform well on clustering tasks are presumed to be high in concept utilization ability.

A large number of the clustering studies involving retardates were designed to assess performance differences between retarded and nonretarded Ss. While direct comparison of the results of these studies is precluded, owing to extensive methodological and/or procedural

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dissimilarities, several general findings appear to be recurrent (Spitz, 1966). These are (a) brighter Ss tend to cluster more than less intelligent Ss, (b) there tends to be a significant relationship between clustering performance and recall proficiency, (c) the clustering performance of retardates may be enhanced by special organization of the stimulus material or by structuring the response set of S, and (d) methods which tend to facilitate clustering have the concomitant effect of increasing recall. Thus, as Spitz (1966) has suggested, ". . . the question is not whether or not retardates group or organize materials, but rather under what conditions, in what manner, and how efficiently they display this capacity."

One of the primary objectives of the present study was to determine whether the associative clustering tendency reflects underlying cognitive processes which are also related to reading ability. This possibility has been suggested by the results of a number of studies, including an investigation by Braun (1963), who employed a verbal concept formation task. The results of this investigation led Braun to conclude that the "classification factor (concept formation ability) is highly related to reading and that this factor is either a separate intellectual process or is a component given little weight in existing intelligence tests."

The second major objective of the present study was to assess the effects of presentation mode on the recall and clustering scores of retarded adolescents. Thus, groups of retarded Ss were presented the stimulus material via (a) the auditory mode, (b) the visual mode or (c) the combined auditory-visual mode. Previous research in this area tends to show that under certain conditions bimodal presentation produces better performance than unimodal presentation (Robinson & Orr, 1966).

Little or no information appears to be available regarding the effects of unimodal versus bimodal presentation on clustering performance.

Method

Subjects: The Ss were 24 male and 46 female mentally retarded adolescents selected from secondary level special education classes of four high schools in the New York City Public School System. No student was included who was judged by his teacher to have language or hearing difficulty severe enough to interfere with his performance on the experimental task. The CA range of the same was from 191 mos. to 266 mos., with a mean of 215.72 and an S.D. of 13.30. The Otis Alpha IQ range was from 51 to 75, with a mean of 66.88 and an S.D. of 5.22. The range of Metropolitan reading grade scores was from 1.9 to 7.2, with a mean of 3.92 and an S.D. of 1.06.

The Ss were randomly assigned to one of three levels of the experimental variable, viz., mode of stimulus presentation. Substitutions were made in cases of apparatus misfunctions and other procedural irregularities. Ten Ss were eliminated for these reasons and were replaced by alternates who were randomly selected from the class rolls. The number of substitutions made was not systematically related to the experimental variable.

Subsequent to the completion of the experiment, Ss from each of the three modality groups were divided into above and below median subgroups on the basis of overall reading grade (RG) levels. Characteristics of the three modality groups are displayed in Table 1.

One way analyses of variance, performed on CA, IQ, MA and RG for the three modality groups revealed no significant differences as a function of random assignment.

Stimuli and Apparatus: The stimulus words used in the present study was originally employed by Rossi (1963). Briefly, four lists of 20 words were obtained by randomizing five words, equated for frequency of appearance in the Thorndike-Lorge (1944) word count, from each of four conceptual categories. These categories were: animals (pig, bear, horse, cat, sheep); clothing (dress, coat, belt, shoe, hat); food (meat, bread, soup, cake, milk) and parts of the body (head, mouth, nose, thumb, leg). No restrictions were placed on the randomization, although none of the randomized lists contained more than two consecutive words from the same category. The visual stimuli were transparencies of primer typed words which were projected from a carousel slide projector onto a 5 1/4 in. high by 7 in. wide HIP side screen viewer. The auditory stimuli were spoken words presented via a Wollensak 3M tape recorder through large earphones with extra padding to minimize extraneous noise. For the bimodal condition, the slide projector and tape recorder were synchronized so that the auditory stimulus was presented one second after the onset of the visual stimulus, which remained on the screen for three seconds. The rate of presentation for all conditions was one word every three seconds. The size of the projected visual stimuli and the volume level for the auditory stimuli were kept as constant as possible for all Ss.

Procedure: The Ss received the experimental treatments in individual sessions from one of three male Es. Each E tested approximately the same number of Ss from each condition. In the Auditory-Visual (AV) and Visual (V) conditions, Ss were seated approximately two feet from the screen. In the Auditory (A) condition, Ss were seated at the same position, although the screen was darkened. The size of the projected

words was such that they could be easily read from much farther distances than required under the experimental conditions. The words were centered horizontally as well as vertically. The tape recorded words were spoken in a clear conversational manner by a male speaker. For all conditions appropriate instructions were read to S by E. The instructions for the AV condition were as follows:

> I want you to do a word game with me. This is easy since you already know all of the words. Okay? Now, on this screen, and through these earphones, you will hear and see a number of words. When all the words have been given, I want you to tell me all the words you can remember. I will nod my head like this (demonstrating) to let you know when all the words have been given. Do you understand? You will hear and see a number of words, and when all the words have been given, I want you to name all the words you can remember. (E requested and answered any relevant questions.) Okay? Now, let's begin.

After each of the four trials, S was asked to "say all the words you can remember. Think hard and take your time." If S failed to produce a new response within approximately one minute after his last response, he was asked if he could think of any other words. If S asked any question about which words he should or had recalled, E merely repeated "say all the words you can remember." The session ended when S indicated that he could produce no more responses. After every trial, S was told that he had done very well.

Results

The experimental arrangements for the present investigation corresponded to a 3 x 2 x 4 factorial analysis of variance, with presentation mode, reading grade and trials as the three independent variables. The two dependent variables of primary interest in the present study were (a) number of correct words recalled and (b) number of words clustered above chance.

Recall: A summary of the treatment group means and standard deviations is presented in Table II.

A 3 x 2 x 4 factorial analysis of variance with repeated measures on the third factor (trials) was performed on these data. The results of this analysis revealed two significant main effects and no significant interactions. Presentation mode was significant at the .05 level (F=6.70; df=2,54). The application of Newman-Kuels tests indicated that while there were no significant differences between the A and V conditions, the combined AV condition produced significantly more correct responses than both Condition A and Condition V ($p < .01$).

The other significant main effect was that of trials at the .01 level (F=51.70; df=3,162). This effect resulted from the strong tendency for Ss to improve over trials. The results of a test for trends revealed a significant linear trend (F=147.77; df=1,162; $p < .001$) as well as a significant cubic trend (F=3.72; df=1,162; $p < .05$). The nature of this trend is illustrated in Fig. 1.

Inspection of this figure and the results of Newman-Kuels tests indicate that there was substantially greater improvement between the second and third trials than between the first and second trials. This created the first deviation from linearity. Further, there was no significant improvement between the third and fourth trials, which created the second deviation from linearity.

Clustering: The measure used for above chance clustering was the number of word clusters expected minus the number of word clusters observed. Following Bousfield (1953), an observed cluster (or repetition) was scored each time a given correct word followed a different correct word from the same category. For the purpose of the present

analysis, all inappropriate words (e.g., perseverations, intrusions, etc.) were excluded.

The formula for expected clusters, described by Spitz (1966), is as follows:

$$E(R) = \frac{m_1^2 + m_2^2 + m_3^2 + m_4^2}{n} - 1$$

where E(R) is expected number of clusters, $\underline{m}_1$, $\underline{m}_2$, $\underline{m}_3$, and $\underline{m}_4$ are the number of words recalled from the various categories, and $\underline{n}$ is the total number of words recalled.

A summary of the treatment group means and standard deviations is presented in Table III.

A 3 x 2 x 4 factorial analysis of variance with repeated measures on the third factor was performed on these data. The results of the analysis revealed one significant main effect for trials ($\underline{F}$=6.37; df=3,162); $\underline{p} < .05$). This main effect resulted from the tendency for Ss to improve over trials. The results of a test for trends revealed a significant linear trend ($\underline{F}$=17.64; df=1,162; $\underline{p} < .01$). There were no significant deviations from linearity ($\underline{F}$=.73; df=2,162). The application of Newman-Kuels tests indicated that trials one and two produced significantly less clustering than trials three and four. There were no significant differences between trial one and trial two and no significant differences between trial three and trial four.

Relations of Clustering to Recall: In order to assess the relations of clustering to recall, Pearson product moment correlation coefficients were computed for the three modality groups separately and for the three groups combined. The results of these analyses are as follows: AV

Group r = .45; A Group r = .51; V Group r = .31; combined Group r = .44. The correlation for the combined group was significant at the .01 level. The correlations for Group AV and Group A were significant at the .05 level. The correlation for group V was not statistically significant.

Discussion

The results of the present investigation revealed that associative clustering performance was not a function of general reading ability. This conclusion was evidenced by the absence of a significant main effect for reading grade in the analysis of variance performed on clustering scores. In confirmation, correlations between clustering scores and reading grade levels for the three modality groups and the combined group were all low and nonsignificant. Contrarily, Braun (1963), with nonretarded Ss, found correlations between concept formation performance and reading comprehension scores to be moderate in magnitude and statistically significant. Further, Braun reported that the correlations between concept formation and comprehension were significantly greater than the correlations between IQ and comprehension. In the present experiment, neither the correlations between IQ and comprehension nor those between MA and comprehension approached statistical significance.

Any one of a number of methodological differences could account for discrepancies between the present findings and those obtained by Braun. First, it should be noted that different conceptual tasks were employed in the two studies. Second, while the present investigator used a general measure of reading ability, Braun used a measure of reading comprehension. Third, while Ss in the present study were adolescent mentally retarded boys and girls (with twice as many girls

as boys), Braun's Ss were younger nonretarded boys who presumably were reading at grade level. Undoubtedly there are many other differences which could have contributed to these discrepant findings. Obviously, much additional research is needed in order to identify and isolate those variables which influence the relations of concept mediation ability to various reading factors.

Another important finding of the present study was that while bimodal presentation had a significant facilitating effect on recall, it had no significant effect on clustering performance. Thus, while Gerjuoy and Spitz (1966) found that methods useful in inducing the retardate to cluster (or organize material) tended to have a facilitating effect on recall, the present study failed to demonstrate the converse. That is, the positive effect of presentation mode on recall apparently was achieved by improving the retardate's rote recall ability rather than by improving his ability to organize the input material.

Finally, as frequently reported in previous studies, the overall correlation between recall and clustering was statistically significant. However, when correlations were computed separately for the three modality groups, only the correlations for the Auditory and Auditory-Visual Groups were statistically reliable. Further, more recent research (Gerjuoy, et al., 1969) has reported that although their normal children clustered more than the retardates, ". . . increased clustering was not significantly related to recall as had been previously found. . . ." Thus, it is apparent that additional research is needed to carefully delineate the conditions under which clustering and recall are significantly related.

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TABLE I

Characteristics of Treatment Groups*

		Auditory	Visual	Auditory + Visual
	N	20	20	20
CA	Mean	213.70	218.70	214.75
	S.D.	17.85	9.96	10.81
IQ	Mean	66.20	67.05	67.40
	S.D.	5.43	6.01	4.27
MA	Mean	137.30	143.05	142.10
	S.D.	12.46	12.85	9.52
RG	Mean	4.17	3.51	4.06
	S.D.	1.22	.89	1.03

*MAs were extrapolated by using CAs and IQs. A CA cut off of 18 years was employed.

TABLE II

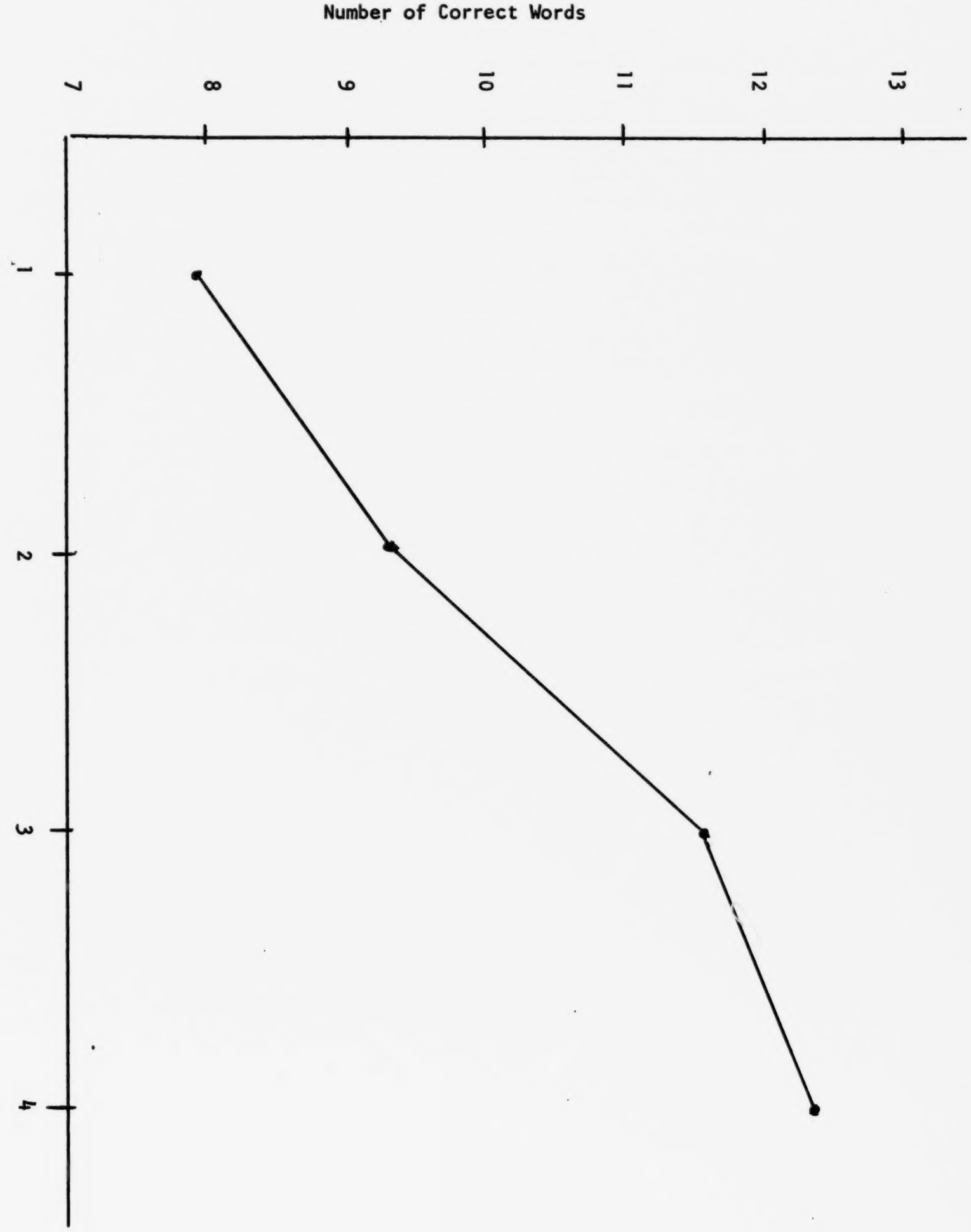
Means and Standard Deviations for Correct Words
(Collapsed over four trials)

	Auditory		Visual		Auditory + Visual	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Hi RG	37.60	6.17	34.60	13.63	48.80	10.35
Lo RG	35.60	8.32	41.40	10.16	46.70	9.53
Hi + Lo RG	36.60	7.58	38.00	12.82	47.75	10.26

TABLE III

Means and Standard Deviations for Above Chance Clustering
(Collapsed over four trials)

	Auditory		Visual		Auditory + Visual	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Hi RG	3.20	2.45	2.48	3.50	5.24	6.02
Lo RG	3.47	2.82	1.32	2.49	3.63	3.20
Hi + Lo RG	3.33	2.71	1.90	3.17	4.43	5.02



THE NUMBER OF CORRECT WORDS RECALLED PLOTTED FOR THE FOUR TRIALS.